

Renewable Fuel Vehicle Modeling and Analysis



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**Project ID #
VSSP_03_broker**

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Overview

Timeline

Project start date: FY08

Project end date: FY09

Percent complete: 50%

Budget

- Total project funding (FY08- FY09)
 - DOE \$150K
 - Contractor \$0K

Barriers

Renewable fuel production

Renewable fuel cost

Hybrid and plug-in hybrid electric vehicle cost

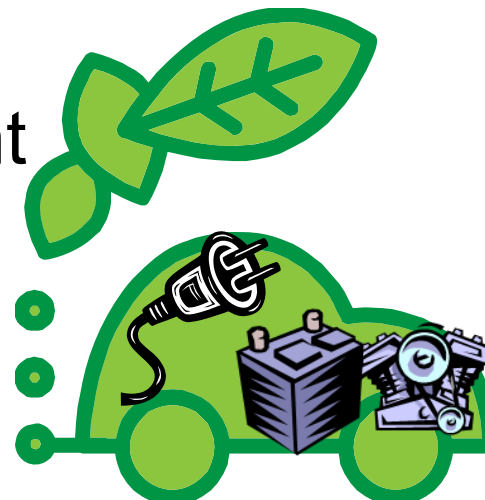
Partners

- Vehicle Systems (DOE)
- Fuels Technologies (DOE)

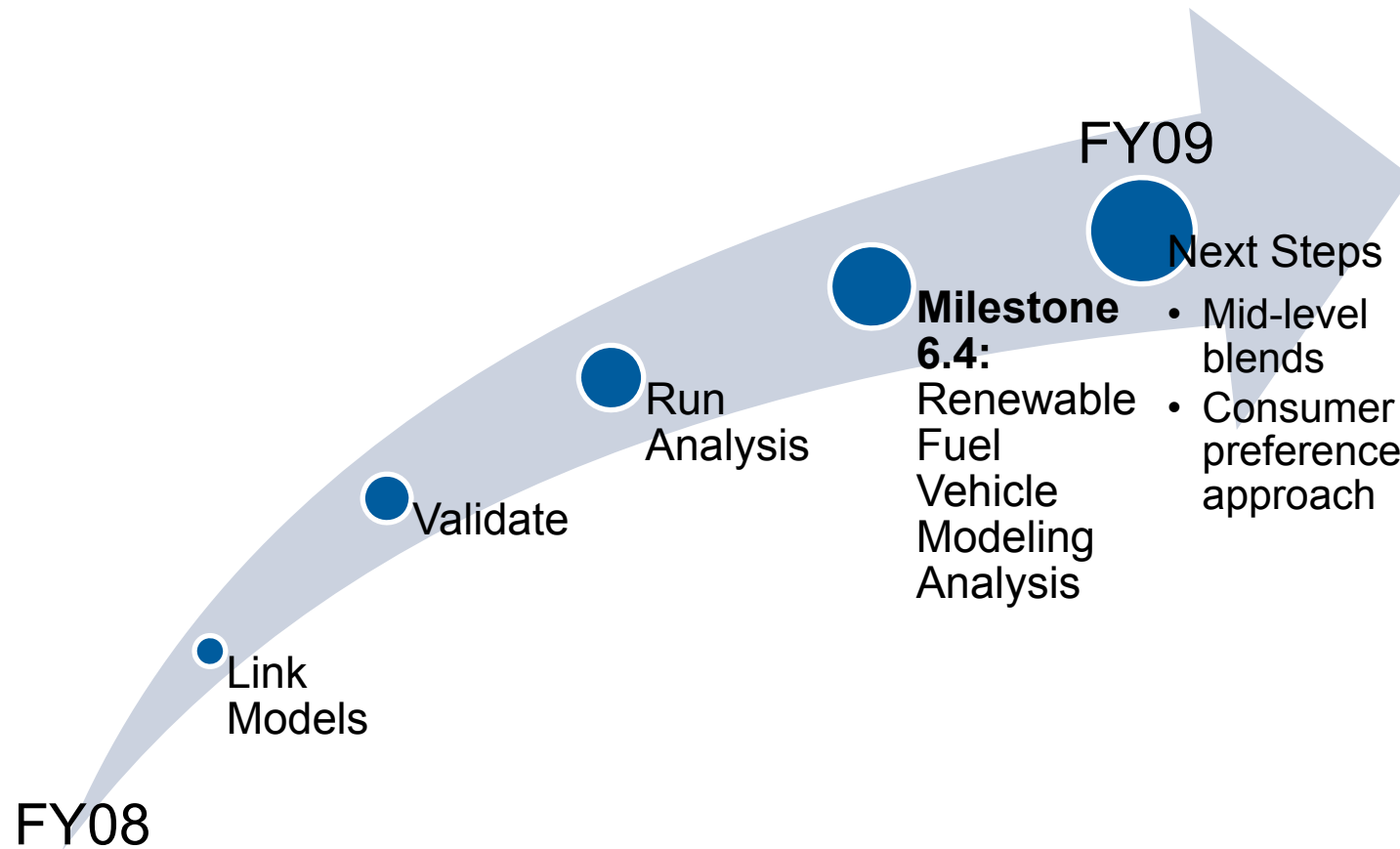
Objective

Evaluate renewable fuel pathways

- Combinations of
 - Renewable fuels (ethanol)
 - Advanced vehicles
- Impact on
 - Petroleum displacement
 - Cost/benefit



Milestones and Timeline

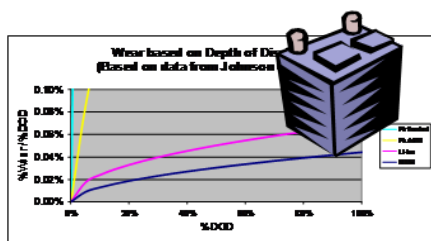


Approach

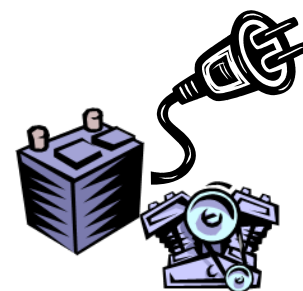
Link Critical Models & Data



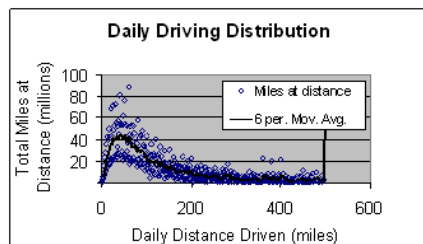
Renewable fuels



Battery wear model



Component cost models



Driving statistics



Fuel economy

Approach

Net Present Cost

What?

NOT the sum of all fuel costs

- The money needed today to pay for the vehicle and all future fuel purchases (e.g., only need \$5 today to pay for \$10 of fuel in 10 years)
- The lower the net present cost, the better the investment

Why?

Cost influences consumers

- ✗ Nobody does the math
- ✓ Not explicitly
 - ✓ Media does it
 - ✓ Concern grows paying for gas
- ✓ → JD Power 2002: "The number one reason for considering a hybrid is concern over high fuel prices"
- ✓ → JD Power 2002: 2/3 of those willing to consider an HEV would NOT consider unless it achieves fuel payback
- ✓ → JD 2004: 2/3 say willing if there is payback
- ✓ → JD 2004: Top reason for staying with conventional: value/costs/operating costs
- ✓ → JD 2008: Main issue considered for hybrid is if the price premium of the powertrain would pay for itself

EPRI 2001: Participants thought fuel cost savings were one of the most attractive features of HEVs. Although environmental benefits, fewer trips to the gas station, and the flexibility of the dual-mode operation were influential in purchasing a vehicle, few respondents were willing to pay more for these attributes.

Approach

Key Assumptions

Long term perspective

E85 has 85% ethanol (in reality it contains less ethanol on average)

Average vehicle: mid-size car (similar to Prius)

35 MPG CAFE

\$4.10/gallon gasoline (EIA 6/30/08)

\$3.34/gallon E85 (e85prices.com 7/8/08)

E85 fuel consumption increase: 33%

\$0.10/kWh electricity (EIA 2007 average)

8% discount rate²

15-year life (BTS)

12,375 miles/year (FHWA)

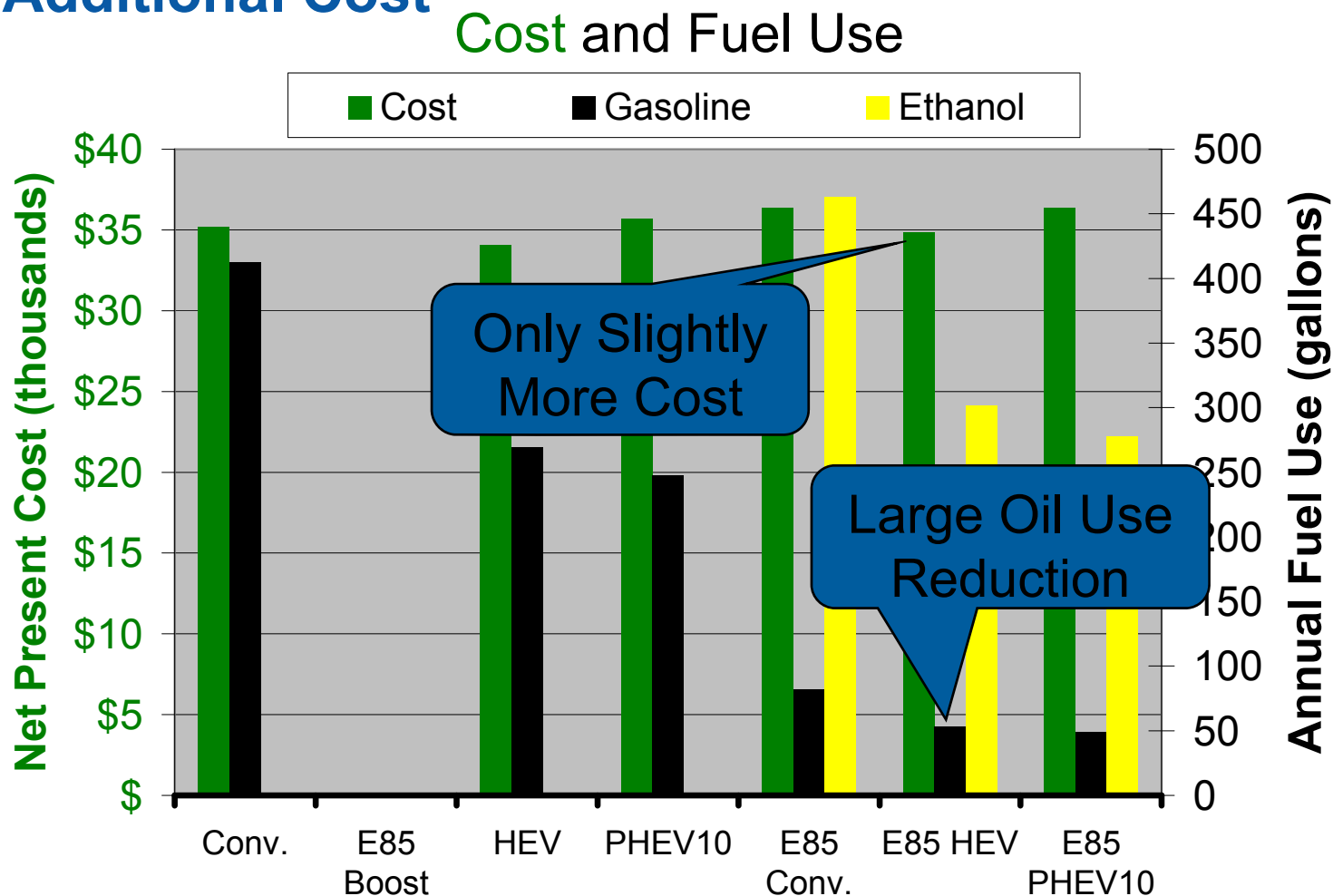
235 million vehicles (BTS)

Ethanol boost efficiency & cost claims¹

1. *Ethanol Turbo Boost For Gasoline Engines*, Ethanol Boosting Systems LLC,
http://www.ethanolboost.com/EBS_Overview.pdf
2. Average stock market return 12% <http://www.finfacts.com/stockperf.htm>, adjusted for 4% inflation, last 7 years averaged < 3%
http://www.inflationdata.com/Inflation/Inflation_Rate/CurrentInflation.asp

Accomplishment

HEVs Could Provide a Large Reduction in Oil Use with Little Additional Cost

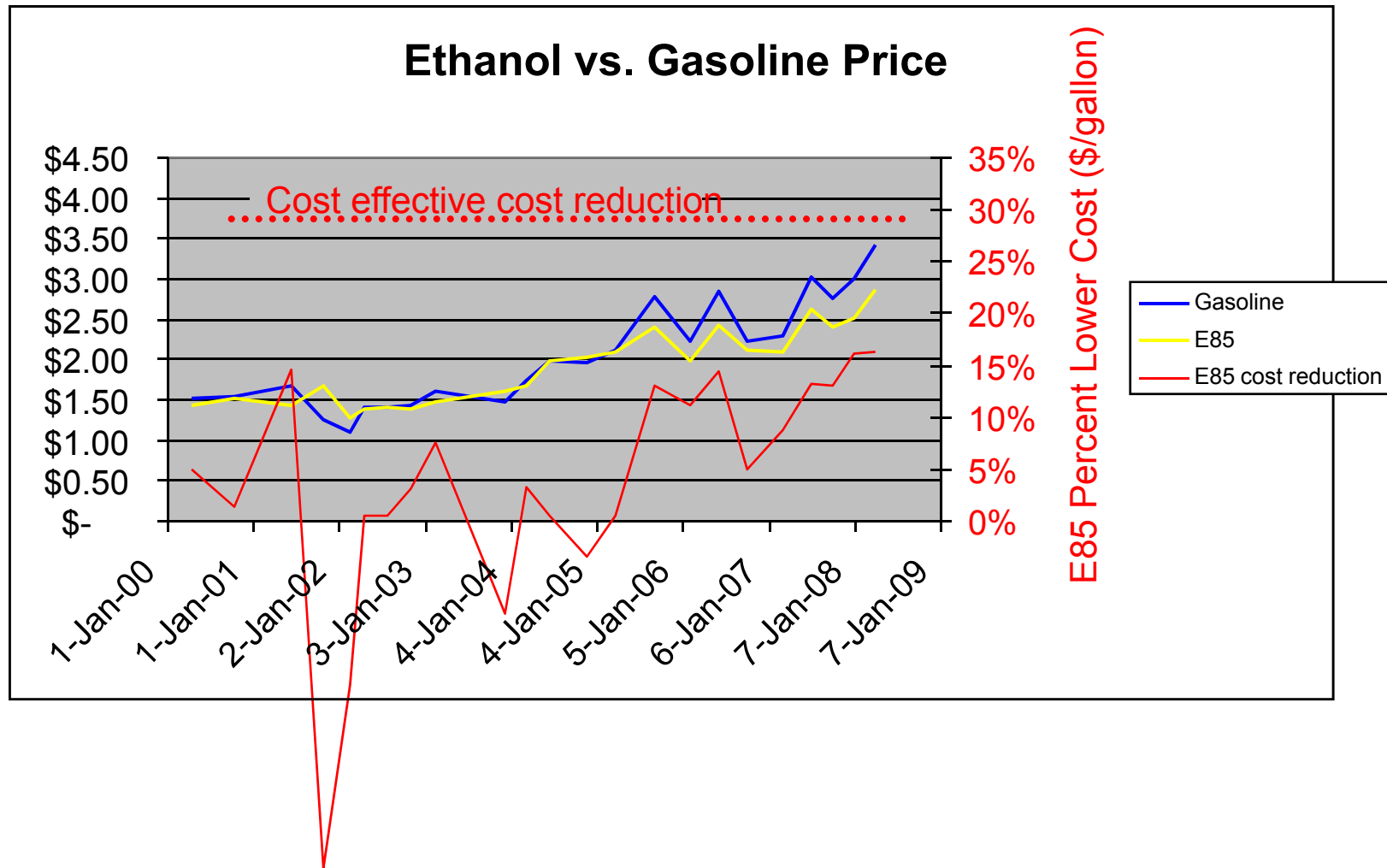


Renewable Fuel Standard (RFS): 36 billion gallons per year by 2022 (<http://www.whitehouse.gov/>)

* Net includes vehicle and fuel cost

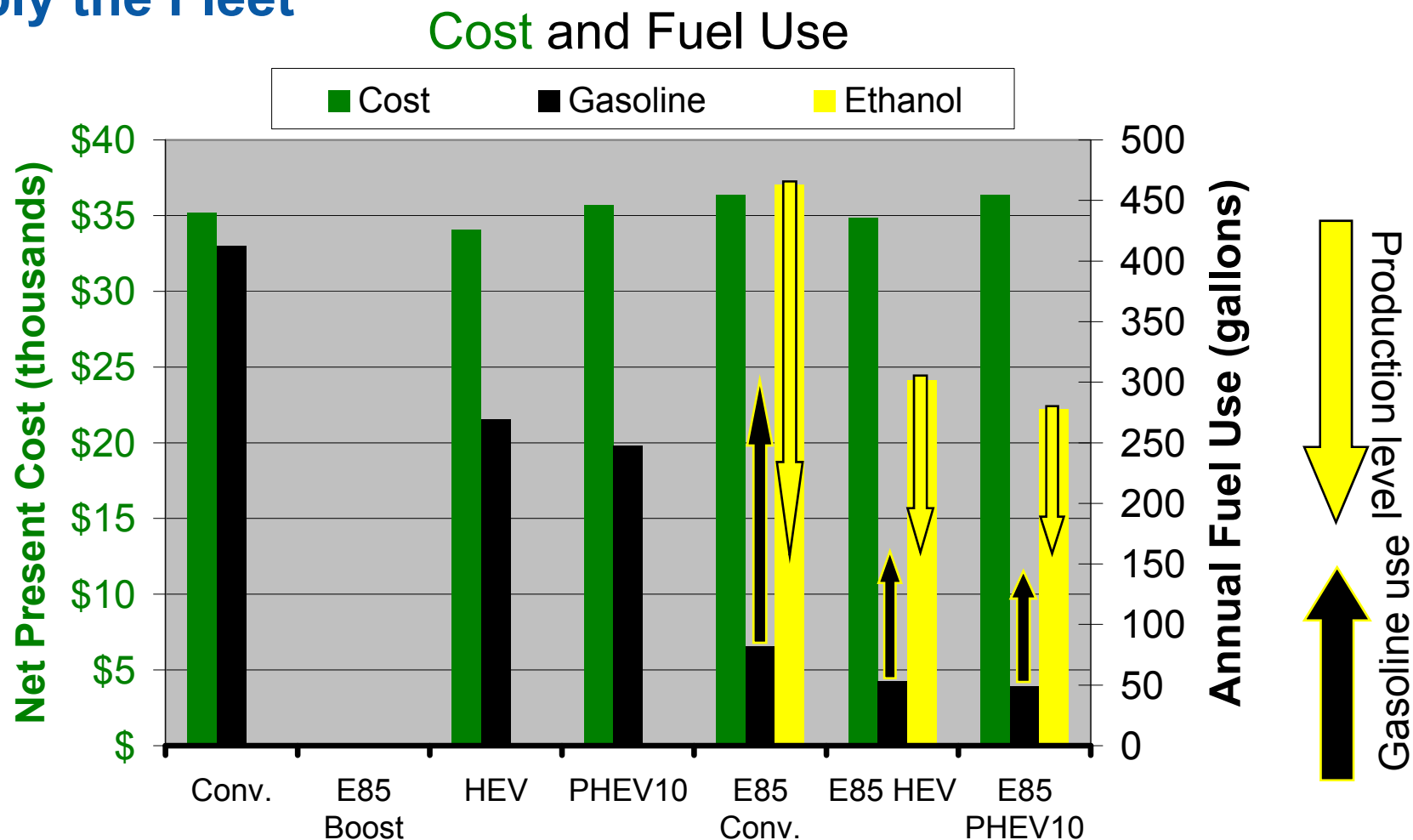
Accomplishment

E85's Price Tracks with Gasoline's, So Flex-Fuel Vehicles Have Been Just Shy Of Cost Effective



Accomplishment

The Ethanol Production Mandate (RFS) Does Not Entirely Supply the Fleet



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Future Work

Add other renewable fuel options for comparison

- Mid-level ethanol blends (10, 15, 20)
- Dedicated E85 vehicles (optimized for E85)
- Biodiesel (B20)
- AER PHEV 40
- Compare
 - Cost/benefit
 - Fuel use compared to production

Technical Target Tool approach

- Trade-off performance, vehicle cost, and fuel cost to find consumer-preferred vehicles
- Estimate oil use reductions based on those preferences

Summary

Flex-fuel vehicles

- Could significantly reduce oil use
- Are capable of using far more ethanol than produced today
- Need lower cost ethanol

Flex-fuel HEVs

- Reduce the long term ethanol production needs
- Provide a low cost, high oil reduction option

Information presented to industry through the Vehicle Systems Analysis Technical Team